INTRODUCTION

This module will provide you with information about the initial response actions you should take when arriving at the scene of a transportation incident involving radioactive material. You will learn how to use the U.S. Department of Transportation's Emergency Response Guidebook (ERG) and also how to isolate and control an accident scene.

You will also be able to identify medical priorities at a radioactive material transportation incident. This module should not be considered comprehensive training on how to use the ERG.

PURPOSE

The purpose of this module is to provide a basic understanding of the initial actions you should take when arriving at a scene of a radioactive material transportation incident.

Your ability to effectively identify the hazard using the ERG will enhance your efficiency in responding to the incident.

MODULE OBJECTIVES

Upon completion of this module, you will be able to:

1. Identify the actions required by "Safety, Isolation, and Notification."
2. Identify the importance of shipping papers.
3. Locate, in the U.S. Department of Transportation Emergency Response Guidebook (ERG), the response guide for radioactive material by using one or all of the following: UN identification number, material name, or shipment placards.

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INITIAL RESPONSE ACTIONS

State, tribal, and local government officials are responsible for providing emergency response to any incident within their jurisdiction, including those involving radioactive material. To successfully deal with transportation incidents involving radioactive material, state, tribal, and local government officials should develop a response plan for these incidents. This plan should be developed before an incident occurs.

If an incident involving radioactive material occurs in your jurisdiction, follow your local and or state emergency response procedures. If your agency does not have procedures in place, the Department of Energy has a TEPP model initial response procedure available.[1]

Safety, Isolation, and Notification

In order for you to effectively carry out your duties as a responder, your protection and safety should be foremost. This should always be your first operational thought at any hazardous material incident scene. A useful acronym to help remember your initial response actions is "SIN." SIN stands for:

Safety first and always
Isolate and deny entry
Notifications

[1] Information can be found on the Department of Energy's web site: http://www.em.doe.gov/otem/program.html

1. **Safety First and Always**
   Approaching an incident involving radioactive material is not significantly different from approaching an incident involving other hazardous material. To ensure your safety, you should always attempt to approach the incident scene from upwind and upslope, trying to identify the hazard from as far away as possible, using binoculars if available. Use the ERG to determine your initial isolation distances.

Once you've ensured your own safety at the scene, your priorities should be for rescue, life saving, first aid, and fire control. According to the ERG, all these priorities are "higher than the priority for measuring radiation levels." All of the guides covering radioactive material in the ERG state that "**radiation presents minimal risk to transport workers, emergency response personnel, and the public during transportation accidents**."

If you need to enter the area to perform rescue operations, you can minimize your radiation exposure by following a few "common sense" guidelines:

- Minimize your **time** in the incident area. The less time you spend in a radiation field, the less radiation dose you will receive.
- Maintain a safe **distance** from radioactive material packages. Do not touch damaged packages or spilled material.
- Use other available material for **shielding** whenever possible. A vehicle between you and the radiation source can reduce your radiation exposure (e.g., ambulance, patrol car, fire pumper, etc.).

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2. **Isolate and Deny Entry to the Area**

When responding to a transportation incident involving radioactive material, isolate the scene to reduce the potential for spreading radioactive contamination and to minimize possible radiation exposure. Guides 161 through 166 in the ERG can be used to determine initial isolation distances. These guides recommend an initial isolation of 80 to 160 feet in all directions. Responders at any hazardous material scene should keep unauthorized personnel away from the area and always try to position themselves uphill, upwind, and upstream of the incident.

If life saving, first aid, or control of fire is not necessary at an incident scene, there is no need for a responder to enter the area. Avoid the urge to go in and "look around." Once the area is isolated, deny entry and wait for members of the hazardous material response team, state radiological control, or other trained personnel to arrive.

Once the area is isolated, try to identify the material involved in the incident; you can refer to the ERG to help identify the material and determine the appropriate immediate steps to take. An overview of the ERG is included in this module.

3. Begin the Notification Process

When a hazardous material incident of any kind occurs, notify the proper agencies and personnel as soon as possible. If you are the first person to arrive on the scene of a radioactive material incident, follow your state or local notification procedure. Your local notification procedure may be similar to this:

Call Dispatch/911

- Ask dispatch to make any other necessary contacts, including:
  - Other local personnel that may be needed
  - State agencies
  - Neighboring jurisdictions that may be affected

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- Include the following information in your notification to dispatch:
  - Your name, agency, and call-back number
  - Radioactive material(s) involved, and type(s) of package(s)
  - Severity of the incident (injuries, breached packages)
  - Incident location
  - Actions already taken
  - On-scene contact (Incident Commander), and how to reach this person
  - How the incident occurred
  - Carrier, shipper, and receiver information (from shipping papers or packages)

- Contact the emergency response telephone number listed on the shipping papers.

- Other notifications: this varies with each organization.

Shipping Papers

The driver of the transport vehicle, if available, can be a valuable source of information about the nature of the material being transported. The driver may also be of assistance when retrieving the shipping papers. The shipping papers contain valuable information on the material being transported. They include the name, address, and telephone number for both the shipper and receiver and contain specific information on the nature of the radioactive contents. The shipping papers will also contain an emergency response telephone number, including the area code or international access code, for use in the event of an emergency involving the material.

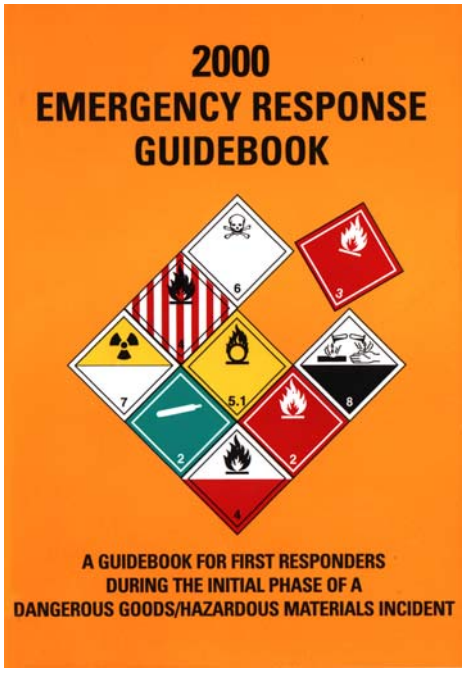
OVERVIEW OF THE EMERGENCY RESPONSE GUIDEBOOK (ERG)

The ERG provides guidelines for responders to use for commonly transported hazardous material, including radioactive material. The guides for radioactive material are numbered 161-166.

Remember that the ERG is only a guidebook and should not take precedence over local standard operating procedures.

The ERG is intended to help you make informed decisions about the type of hazards involved and the initial precautions to take. To use the ERG effectively, you should become familiar with the ERG **prior** to an emergency.

The guidebook lists the four-digit United Nations Identification Number (UN ID) used on shipping papers, package markings and some placards as well as the Proper Shipping Names of hazardous material. Each hazard has a guide and precautions designed to protect responders from harm. The guidebook also lists common placards used in the transportation of hazardous material.



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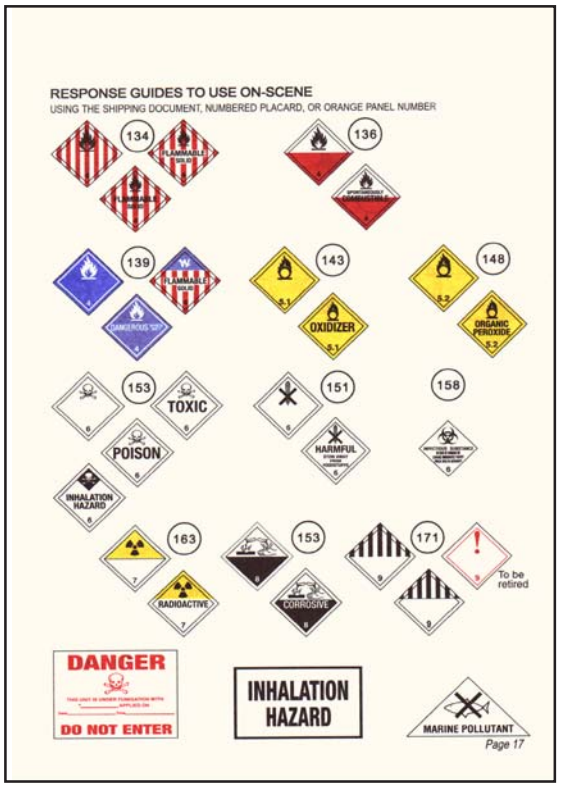
Overview of color-coded sections:
The initial section is **white** and contains general guidelines for *any* hazardous material situation. It addresses safety precautions and who to call for assistance. The initial white section also contains the "table of placards and initial response guides." The table of placards shows many of the placards used for hazardous material transport.

You can refer to the table of placards and initial response guides if you respond to an incident involving placarded material but are unsure of what material is represented by the placard. Match the vehicle placard(s) with one of the placards displayed on the table of placards. A numbered guide is located next to each placard in the table and is shown as a circled number next to each placard.

Use this guide number until the hazardous material involved can be specifically identified. For example, if you see the radioactive placard and have no other information, you can determine the guide number (163) by looking at the circled number next to the radioactive placard on the table (*see example below*).



The **yellow** section shows, in numerical order, the four-digit UN ID number assigned to each hazardous material. By looking up the UN ID number, you can find the appropriate guide number and name of the hazardous material. For example, if you were looking up UN ID number 2982, you would find that the name of the material is "Radioactive Material, n.o.s." and that the guide number is 163 (*See below).*

ID No.	Guide No.	Name of material
2949	154	Sodium hydrosulphide, with not less than25% water of crystalization
2950	138	Magnesium granules, coated
2951	149	Diphenyloxide-4, 4'-disulfohydrazide
2951	149	Diphenyloxide-4, 4'-disulfohydrazide
2952	150	Azodiisobutyronitrile
2953	150	2, 2'-Azodi-(2,4-dimethylvaleronitrile)
2954	149	1,1'-Azoodi-(hexahydrobenzonitrile)
2955	150	2,2'-Azodi- (2,4-dimethyl-4-methoxyvaleronitrile)
2956	149	5-tert-Butyl-2,4,6-trinitro-m-xylene
2956	149	Musk xylene
2965	139	Boron trifluoride dimethyl etherate
2966	153	Thioglycol
2967	154	Sulfamic acid
2967	154	Sulphamic acid
2968	135	Maneb, stabilized
2968	135	Maneb preparation, stabilized
2969	171	Castor beans, meal, pomace or flake
2970	149	Benzene sulfohydrazide
2970	149	Benzene sulphohydrazide
2971	149	Benzene-1,3-disulfohydrazide
2971	149	Benzene-1,3-disulphohydrazide
2972	149	N,N'-Dinitrosopentamethylene tetramine
2973	149	N,N'-Dinitroso-N,N'-dimethyl terephthalamide
2974	164	Radioactive material, special form, n.o.s.
2975	162	Thorium metal, pyrophoric
2976	162	Thorium nitrate, solid
2977	166	Radioactive material, Uranium hexafluoride, fissle
2977	166	Uranium hexafluoride, fissle containing more than 1% Uranium-235
2978	166	Radioactive material, Uranium hexafluoride, non fissle or fissle-excepted
2978	166	Uranium hexafluoride, fissle-excepted
2978	166	Uranium heafluoride, low specific activity
2978	166	Uranium hexafluoride, non-fissle
2979	162	Uranium metal, pyrophoric
2980	162	Uranyl nitrate, hexahydrate, solution
2981	162	Uranyl nitrate, solid
2982	163	Radioactive material, n.o.s.
2983	129P	Ethylene oxide and Propylene oxide mixture, with not more than 30% Ethylene oxide
2983	129P	Propylene oxide and Ethylene oxide mixture, with not more than 30% Ethylene oxide
2984	140	Hydrogen peroxide, aqueous solution, with not less than 8% but less than 20% Hydrogen peroxide
2985	155	chlorosilanes, flammable, corrosive, n.o.s.
2985	155	Chlorosilanes, n.o.s.
2986	155	Chlorosilanes, corrosive flammable, n.o.s.

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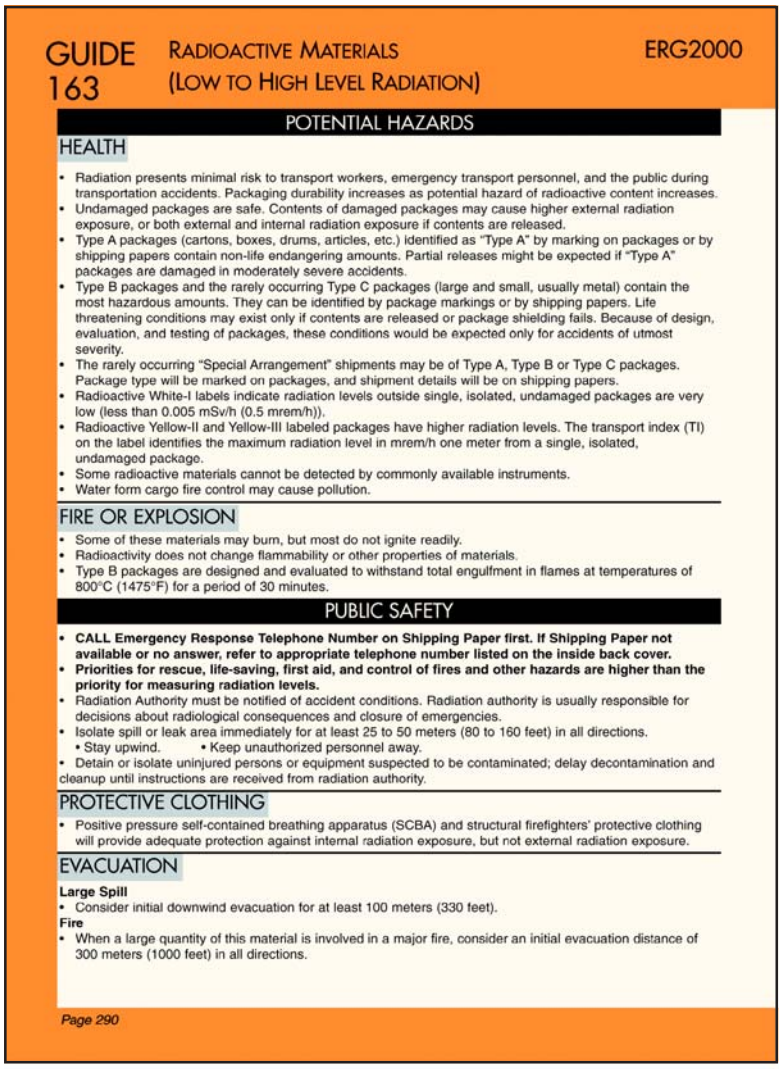
The **blue** section alphabetically lists each hazardous material by Proper Shipping Name. By looking up the name of the material in this section, you can locate the appropriate guide number and UN ID number for it. For example, if you look up "Radioactive Material, n.o.s.," you find, again, that the Guide number is 163 and that the UN ID number is 2982 (*See below*).

Name of Material	Guide No.	ID No.
Radioactive material, low specific activity (LSA-II)	162	3321
Radioactive material, low spwcific activity (LSA-II), fissle	165	3324
Radioactive material, low specific activity (LSA-III)	162	3322
Radioactive material, low specific activity (LSA-III) fissle	165	3325
Radioactive material, n.o.s.	163	2982
Radioactive material, special form, n.o.s.	164	2974
Radioactive material, surface contaminated objects (SCO)	162	2913
Radioactive material, surface contaminated objects (SCO-I)	162	2913
Radioactive material, surface contaminated objects (SCO-I) fissle	165	3326
Radioactive material, surface contaminated objects (SCO-II)	162	2913
Radioactive material, surface contaminated objects (SCO-II), fissle		
Radioactive material, transported under special arrangement	163	2919
Radioactive material, transported under special arrangement, fissle	165	3331
Radioactive material, Type A package	163	2915
Radioactive material, Type A package, fissle	165	3327
Radioactive material, Type A package, special form	164	3332
Radioactive material, Type A package, special form, fissle	165	3333
Radioactive material, Type B(M) package	163	2917
Radioactive material, Type B(M) package, fissle	165	3329
Radioactive material, Type B(U) package	163	2916
Radioactive material, Type B(U) package, fissle	165	3328
Radioactive material, Type C package	163	3323
Radioactive material, Type C package, fissle	165	3330
Radioactive material, Uranium hexafluoride, fissle	166	2977
Radioactive material, Uranium hexafluoride, non-fissle or fissle-excepted	166	2978
Rags, oily	133	1856
Rare gases and Nitrogen mixture	121	1981
Rare gases and Nitrogen mixture, compressed	121	1981
Rare gases and Oxygen mixture	122	1980
Rare gases and Oxygen mixture, compressed	122	1980
Rare gases mixture	121	1979
Rare gases misture, compressed	121	1979
Receptacles, small, containing gas	115	2037
Red phosphorus	133	1338
Red phosphorus, amorphous	133	1338
Refrigerant gas, n.o.s.	126	1078
Refrigerant gas, n.o.s. (flammable)	115	1954
Refrigerant gas R-12	126	1028
Refrigerant gas R-12 and Refrigerant gas R-125a azeotropic mixture with 74% Refrigerant gas R-12	126	2602

The **orange** section contains the guides for dealing with each material. These guides list the precautions to take for each hazardous material. The guides identify potential hazards (health, and fire or explosion) and emergency actions (initial, fire, spill or leak, and first aid) associated with each material. Each guide is two pages. Guide 163 is shown below and on the following page.



GUIDE 163 — RADIOACTIVE MATERIALS (LOW TO HIGH LEVEL RADIATION) — ERG2000

POTENTIAL HAZARDS

HEALTH

- Radiation presents minimal risk to transport workers, emergency transport personnel, and the public during transportation accidents. Packaging durability increases as potential hazard of radioactive content increases.
- Undamaged packages are safe. Contents of damaged packages may cause higher external radiation exposure, or both external and internal radiation exposure if contents are released.
- Type A packages (cartons, boxes, drums, articles, etc.) identified as "Type A" by marking on packages or by shipping papers contain non-life endangering amounts. Partial releases might be expected if "Type A" packages are damaged in moderately severe accidents.
- Type B packages and the rarely occurring Type C packages (large and small, usually metal) contain the most hazardous amounts. They can be identified by package markings or by shipping papers. Life threatening conditions may exist only if contents are released or package shielding fails. Because of design, evaluation, and testing of packages, these conditions would be expected only for accidents of utmost severity.
- The rarely occurring "Special Arrangement" shipments may be of Type A, Type B or Type C packages. Package type will be marked on packages, and shipment details will be on shipping papers.
- Radioactive White-I labels indicate radiation levels outside single, isolated, undamaged packages are very low (less than 0.005 mSv/h (0.5 mrem/h)).
- Radioactive Yellow-II and Yellow-III labeled packages have higher radiation levels. The transport index (TI) on the label identifies the maximum radiation level in mrem/h one meter from a single, isolated, undamaged package.
- Some radioactive materials cannot be detected by commonly available instruments.
- Water form cargo fire control may cause pollution.

FIRE OR EXPLOSION

- Some of these materials may burn, but most do not ignite readily.
- Radioactivity does not change flammability or other properties of materials.
- Type B packages are designed and evaluated to withstand total engulfment in flames at temperatures of 800°C (1475°F) for a period of 30 minutes.

PUBLIC SAFETY

- **CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- **Priorities for rescue, life-saving, first aid, and control of fires and other hazards are higher than the priority for measuring radiation levels.**
- Radiation Authority must be notified of accident conditions. Radiation authority is usually responsible for decisions about radiological consequences and closure of emergencies.
- Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
  • Stay upwind. • Keep unauthorized personnel away.
- Detain or isolate uninjured persons or equipment suspected to be contaminated; delay decontamination and cleanup until instructions are received from radiation authority.

PROTECTIVE CLOTHING

- Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide adequate protection against internal radiation exposure, but not external radiation exposure.

EVACUATION

Large Spill

- Consider initial downwind evacuation for at least 100 meters (330 feet).

Fire

- When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.

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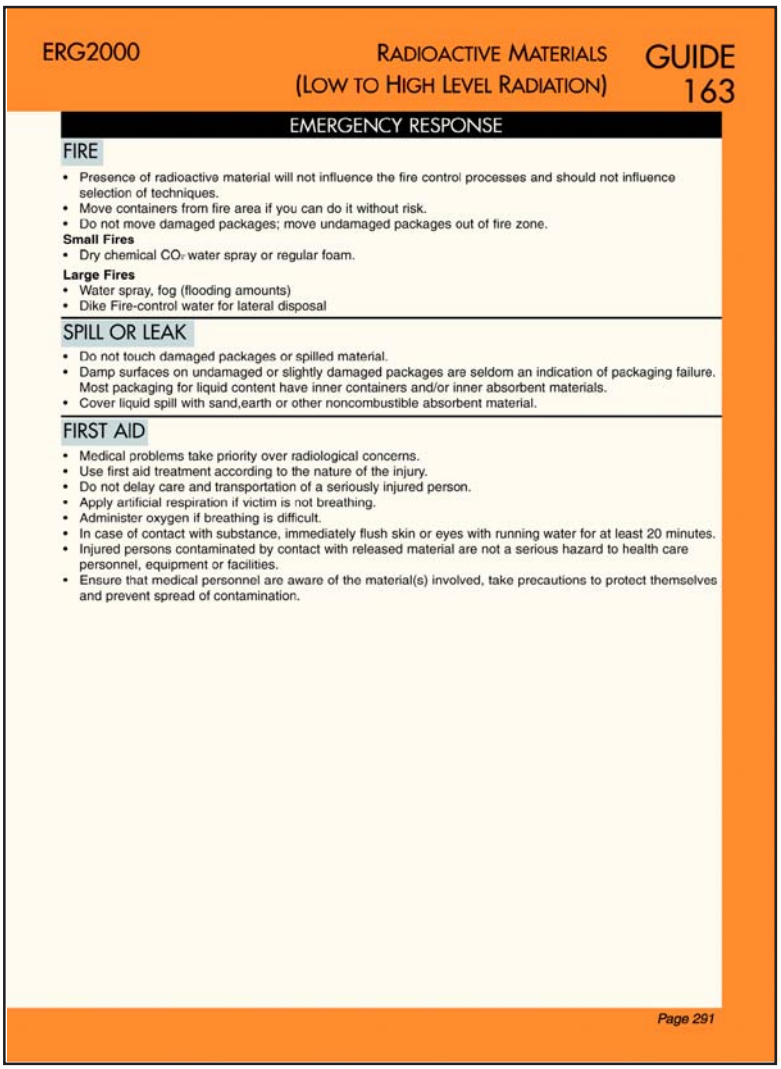
Page 2 of Guide 163 lists the emergency actions for fire, spill or leak, and first aid.



ERG2000

RADIOACTIVE MATERIALS (LOW TO HIGH LEVEL RADIATION)

GUIDE 163

EMERGENCY RESPONSE

FIRE

- Presence of radioactive material will not influence the fire control processes and should not influence selection of techniques.
- Move containers from fire area if you can do it without risk.
- Do not move damaged packages; move undamaged packages out of fire zone.

Small Fires

- Dry chemical CO_2 water spray or regular foam.

Large Fires

- Water spray, fog (flooding amounts)
- Dike Fire-control water for lateral disposal

SPILL OR LEAK

- Do not touch damaged packages or spilled material.
- Damp surfaces on undamaged or slightly damaged packages are seldom an indication of packaging failure. Most packaging for liquid content have inner containers and/or inner absorbent materials.
- Cover liquid spill with sand,earth or other noncombustible absorbent material.

FIRST AID

- Medical problems take priority over radiological concerns.
- Use first aid treatment according to the nature of the injury.
- Do not delay care and transportation of a seriously injured person.
- Apply artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Injured persons contaminated by contact with released material are not a serious hazard to health care personnel, equipment or facilities.
- Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

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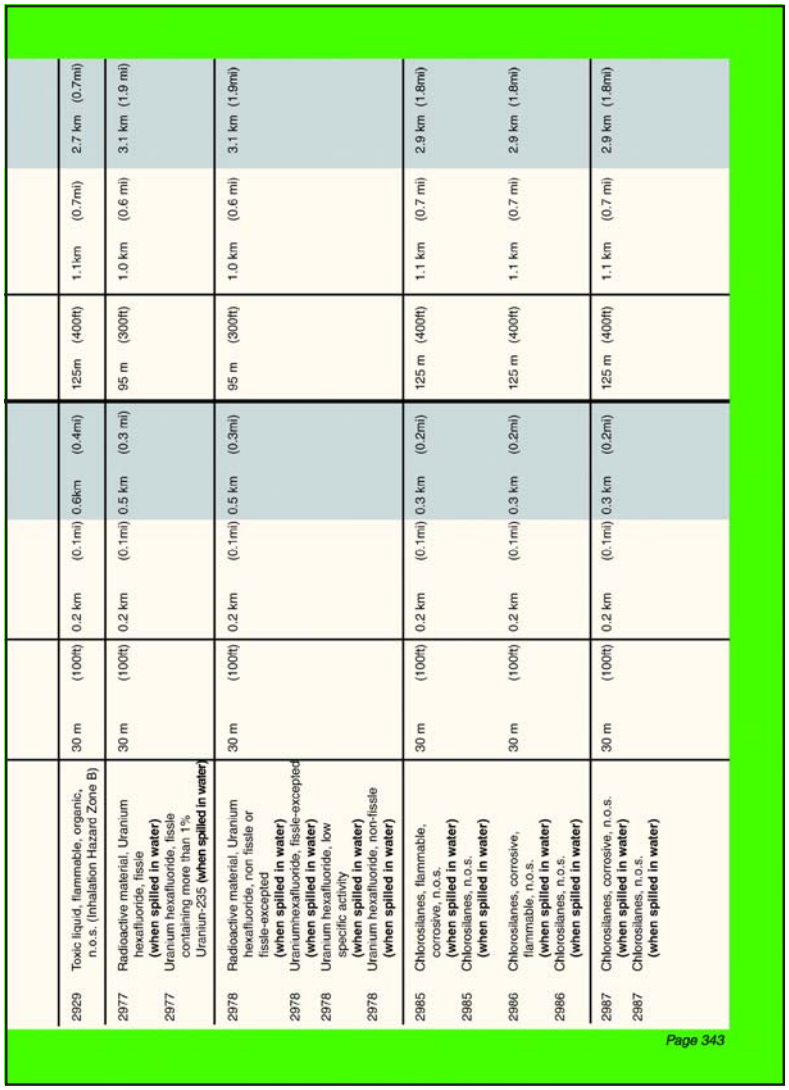
The **green** section contains the table of initial isolation and protective action distances. These distances are useful for protecting people from vapors resulting from spills considered poisonous or toxic if inhaled. If you find an index entry is highlighted in the yellow or blue sections, look for the UN ID number and name of the material in the table of initial isolation and protective action distances. If necessary, begin protective actions immediately.



2929	Toxic liquid, flammable, organic, n.o.s. (Inhalation Hazard Zone B)	30 m	(100ft)	0.2 km	(0.1mi)	0.6km	(0.4mi)	125m	(400ft)	1.1km	(0.7mi)	2.7 km (0.7mi)
2977	Radioactive material, Uranium hexafluoride, fissile **(when spilled in water)**	30 m	(100ft)	0.2 km	(0.1mi)	0.5 km	(0.3 mi)	95 m	(300ft)	1.0 km	(0.6 mi)	3.1 km (1.9 mi)
2977	Uranium hexafluoride, fissile containing more than 1% Uranium-235 **(when spilled in water)**											
2978	Radioactive material, Uranium hexafluoride, non fissile or fissile-excepted **(when spilled in water)**	30 m	(100ft)	0.2 km	(0.1mi)	0.5 km	(0.3mi)	95 m	(300ft)	1.0 km	(0.6 mi)	3.1 km (1.9mi)
2978	Uraniumhexafluoride, fissile-excepted **(when spilled in water)**											
2978	Uranium hexafluoride, low specific activity **(when spilled in water)**											
2978	Uranium hexafluoride, non-fissile **(when spilled in water)**											
2985	Chlorosilanes, flammable, corrosive, n.o.s. **(when spilled in water)**	30 m	(100ft)	0.2 km	(0.1mi)	0.3 km	(0.2mi)	125 m	(400ft)	1.1 km	(0.7 mi)	2.9 km (1.8mi)
2985	Chlorosilanes, n.o.s. **(when spilled in water)**											
2986	Chlorosilanes, corrosive, flammable, n.o.s. **(when spilled in water)**	30 m	(100ft)	0.2 km	(0.1mi)	0.3 km	(0.2mi)	125 m	(400ft)	1.1 km	(0.7 mi)	2.9 km (1.8mi)
2986	Chlorosilanes, n.o.s. **(when spilled in water)**											
2987	Chlorosilanes, corrosive, n.o.s. **(when spilled in water)**	30 m	(100ft)	0.2 km	(0.1mi)	0.3 km	(0.2mi)	125 m	(400ft)	1.1 km	(0.7 mi)	2.9 km (1.8mi)
2987	Chlorosilanes, n.o.s. **(when spilled in water)**											

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The **final white** section contains information on protective clothing as well as fire and spill control methods. Also included is information about criminal/terrorist use of chemical and biological agents including the differences between a chemical and a biological agent, indicators of a possible chemical incident, indicators of a possible biological incident, personal safety considerations, and decontamination measures. The final white section also contains a glossary of terms.

Shipping Comparison

Studies estimate that approximately 500 billion commodity packages are transported each year in the United States. Of these 500 billion packages, about 100 million contain hazardous material. Of those, approximately 3 million packages contain radioactive material. So, of all the packages of commodities that travel across the U.S. each year, only 1 in every 166,667 contains radioactive material.

Check Your Understanding

1. A useful acronym to help remember your initial response actions is SIN. The acronym stands for _____, _____, and _____.

2. When approaching the scene, you should attempt to identify the hazard from as far away as possible, using _____ if available.

3. If the responder at the scene of a transportation accident sees a placarded vehicle but does not know what material is represented by the placard, what section of the ERG should be consulted?
   a) The yellow section
   b) The green section
   c) The initial white section
   d) The orange guide pages

4. Which section of the ERG lists, in numerical order, UN Identification Numbers?
   a) The yellow section
   b) The green section
   c) The initial white section
   d) The orange guide pages

5. The _____ section of the ERG contains the guides to handling each material.

6. The guides for radioactive material recommend an initial isolation of ___ to ____ feet in all directions.

7. According to the ERG, _____ _____ should always take priority over radiological concerns at a radioactive material incident.

M E R R T T




ANSWERS

1. safety
   isolation
   notification
2. binoculars
3. c
4. a
5. orange
6. 80
   160
7. medical
   problems